

Claims

1. A method of modifying starch or starch derivatives comprising: introducing a continuous flow of starch substrate, gas and, optionally, one or more reagents, into a reactor, wherein the starch substrate has a moisture content of between 0 and 45% by weight, a residence time in the reactor of between 1 and 60 minutes and is heated to between 50 and 220°C, characterised in that the starch substrate and the gas are introduced into the reactor in opposing directions and in that the reactor has a tubular body comprising a rotating shaft upon which is disposed one or a plurality of blades.
2. A method according to claim 1 wherein the blades have a tip speed of between 2 and 30 m/s, preferably between 3 and 25 m/s.
3. A method according to claim 1 or claim 2 wherein the starch substrate has a moisture content of between 1 and 30% by weight.
4. A method according to any one of the preceding claims wherein the starch substrate is selected from a native starch, starch derivative, starchy material and mixtures of two or more thereof.
5. A method according to any one of the preceding claims wherein the starch substrate is introduced into the reactor in powder form.
6. A method according to any one of the preceding claims wherein the reagent is selected from a hydrolysing agent, an oxidation agent, an acid, a dextrinisation agent, an alkylation agent, an esterification agent, an etherification agent, a cross-bonding agent and mixtures of two or more thereof.
7. A method according to any one of the preceding claims wherein the reagent is selected from a mineral acid, a peroxide, an oxidising agent and mixtures of two or more thereof.

8. A method according to any one of the preceding claims wherein the one or more reagents are added in an amount between 0.001 and 20% by weight.
9. A method according to any one of the preceding claims wherein the one or more reagents are introduced into the reactor in liquid, powder or gas form.
10. A method according to any one of the preceding claims wherein at least one of the one or more reagents is added to the starch substrate before being introduced into the reactor.
11. A method according to any one of the preceding claims wherein the residence time of the starch in the reactor is between 2 and 45 minutes.
12. A method according to any one of the preceding claims wherein the reaction is maintained at a temperature between 80 and 220°C.
13. A method according to any one of the preceding claims wherein the gas introduced into the reactor is selected from: air, steam, nitrogen, carbon dioxide and a mixture of two or more thereof.
14. A method of preparing highly soluble starch comprising: introducing a continuous flow of starch substrate, gas and, one or more reagents selected from a mineral acid, a peroxide and an oxidising agent, into a reactor, wherein the starch substrate has a moisture content between 1 and 30% by weight, a residence time in the reactor of between 2 and 45 minutes and is heated to between 80 and 220°C, characterised in that the starch substrate and the gas are introduced into the reactor in opposing directions and in that the reactor has a tubular body comprising a rotating shaft upon which is disposed one or a plurality of blades.
15. A method according to claim 14, wherein the reaction is carried out under alkaline conditions.

16. A method according to claim 14 or claim 15, wherein the highly soluble starch is from 70% to 100% soluble in water having a temperature of no more than 50°C.

17. Use of a reactor for the modification of starch or starch derivatives, said reactor having a tubular body comprising:

- a rotating shaft upon which is disposed one or a plurality of blades; and
- at least two inlets, one for the introduction of a starch substrate and, optionally, one or more reagents, and one for the introduction of a gas, characterised in that the inlets are positioned such that the starch and gas are introduced into the reactor in opposing directions.

18. Use according to claim 17 wherein the blade or blades have a tip speed of between 2 and 30 m/s, preferably between 3 and 25 m/s.

19. Use according to claim 17 or claim 18 for the hydrolysis, degradation, oxidation, acid degradation, dextrinisation, bleaching, etherification, esterification, cross-bonding, alkylation or acetylation of starch and/or starch derivatives.